CALIFORNIA DIVISION OF MINES AND GEOLOGY
FAULT EVALUATION REPORT FER-195
Supplement No. 1
Further work on the Murrieta Creek fault, Riverside County

by
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INTRODUCTION

Since the completion of FER 195 in June 1988, additional geologic investigations of the fault extending northwesterly from the Rancho California Business Park have been completed. These have resulted in the fault being named the Murrieta Creek fault (Leighton and Associates, 1988; Bergmann and Rockwell, 1989). They have also demonstrated that the fault has Holocene offset and is somewhat different from the fault shown on the preliminary Special Studies Zones map of the Murrieta quadrangle (California Division of Mines and Geology, 1989) (figure 2). The detailed mapping, along with the trench data, shows that additional strands of the fault should be zoned under the Alquist-Priolo Special Studies Zones Act and that two inferred fault traces previously recommended for zoning are not fault related.

DETAILED GEOLOGIC INVESTIGATIONS

Three geologic reports on the area northwest of the Rancho California Business Park have been filed with the Division of Mines and Geology since FER-195 was completed (Leighton and Associates, 1988; 1989; Schaefer Dixon Associates, 1989)(figure 1), these will be discussed from southeast to northwest.

The report by Schaefer Dixon Associates (1989) includes an investigation of the north end of the Rancho California ground cracks and of geomorphic and tonal features on the same property (Figure 1). The ground cracks were trenched and found to coincide with a previously existing Holocene fault (locality 1, figure 1). This fault appears to die out to the north as it was not found in trenches across its northern projection.

A previously unmapped fault was found trending northwesterly from the zone of ground cracking (locality 2, figure 1). It connects the zone of ground cracking with the fault that was previously recommended for zoning to the north (figure 2). Trenches across this fault segment show that it has offset Holocene alluvium.

The property to the northwest was investigated by Leighton and Associates (1988) (figure 1). Trenches across the fault on this property were visited by this writer in June, 1988 and preliminary results are described in FER-195. The final report by Leighton and Associates (1988) and an abstract based on the same data (Bergmann and Rockwell, 1989) have further documented that the northwest-trending fault vertically offsets Holocene alluvium as much as 50 feet. This fault was named the Murrieta Creek fault.

The next property to the north was also investigated by Leighton and Associates (1989). The northwest-trending fault loses its expression as a scarp within 500 feet of the southeast boundary of this property. Two northwest trending tonal lineaments to the northwest were recommended for zoning in FER-195 because they extend from the end of the scarp along the same general trend (locality 3, figure 1). A trench across this lineament by Leighton and Associates showed no faults or unusual features to a depth of about 12 feet.

Trenching of other tonal lineaments and subtle geomorphic features mapped by Leighton and Associates showed that the fault splits into two branches near the southeastern boundary of this property. One branch fault extends almost due north (locality 4, figure 1) along a tonal lineament mapped by Leighton and Associates. This tonal lineament is not as long or as continuous on the available aerial photographs as it was mapped by Leighton and Associates. Two trenches across this fault show decreasing offset to the north. Five other trenches across this lineament farther to the north did not reveal any faults to a depth of ten to twelve feet.

The other branch of the fault extends to the northwest from the end of the scarp (locality 5, figure 1). Three trenches across this fault show decreasing amounts of offset to the northwest in alluvium. Two other trenches farther to the northwest did not encounter the fault.

Another fault was found approximately 1000 feet to the north, on the same general trend. (locality 6, figure 1). Four trenches were excavated across this fault by Leighton and Associates. Three of these show faults in late Pleistocene "older alluvium". This alluvium is estimated to be 100,000 to 200,000 years old by T. Rockwell, presumably based on soil development (Leighton and Associates, 1989). The fourth trench, between two others, shows faults in late Pleistocene Pauba Formation overlain by undeformed older alluvium. Leighton and Associates concludes that this fault has no evidence for Holocene activity.

INTERPRETATION OF AERIAL PHOTOGRAPHS

The main trace of the Murrieta Creek fault is defined by a prominent scarp as shown on figure 1 and described in FER 195. At the north end of this scarp geomorphic expresion of the fault becomes much less distinct. Northwest-trending scarps and tonal lineaments and north-trending tonals are distributed over a broad area (figure 1). These features were observed on aerial photographs taken by the USDA in 1953 and the USGS in 1967. Some (but not all) of these lineaments are also visible on aerial photos loaned to the DMG by Mark Bergmann of Leighton and Associates (Don Read Corporation, 1964; Riverside County Flood Control District, 1968,1974; Geo-tech Imagery, 1987). The locations of these lineaments are plotted on figure 1.

The most prominent of the northwest trending scarps is at locality 7 (figure 1). This sharp scarp appears to be between 1 and 2 meters high. A tonal lineament follows the scarp for much of its length. The scarp separates the low rolling hills underlain by Pauba Formation and older alluvium from the Murrieta Creek floodplain. The scarp is partly paralleled by a road and modified by agricultural grading on the 1953 photos. On 1967 and later photos further grading has completely obscured the geomorphic feature.

Trenches by Leighton and Associates crossed the scarp, but they revealed no indications of faulting in older alluvium. They also did not reveal any evidence for the scarp or the older alluvium-young alluvium contact. It is possible that the scarp was artificial or that grading removed the scarp and stripped off the younger alluvium.

A zone of tonal lineaments trend northerly from the scarp of the Murrieta Creek fault across the floodplain of Murrieta Creek. These tonals form a zone about 800 feet wide and 3500 feet long. They appear to be soil moisture and/or vegetation contrasts without any associated topographic expression. Two lineaments near locality 8 (figure 1) are curved, relatively broad, light toned lines, suggesting that they are buried channel deposits. Others may be related to old roads, fence lines or other artificial surface features. It is not possible to determine, with the available aerial photos, if any of them are fault related. One of these lineaments (locality 9, figure 1) was trenched. No faults were found, suggesting that this tonal also is artificial. Other lineaments to the east were not trenched and their origin is uncertain.

CONCLUSIONS

Detailed mapping and subsurface exploration by Leighton and Associates (1988, 1989) and Schaefer Dixon Associates (1989) has refined the location of parts of the Murrieta Creek fault. Trench data show that the fault offsets Holocene alluvium. The fault coincides with northeast facing scarps and some of the tonal lineaments seen on aerial photographs. Other tonal lineaments were trenched and do not coincide with faults. They appear to be related to buried stream channels and artificial features. Some tonal features were not trenched, however, and their origin is uncertain.

RECOMMENDATIONS

The northwestern strands of the Murrieta Creek fault shown on the Preliminary Special Studies Zone map of the Murrieta quadrangle (California Division of Mines and Geology, 1989) should be revised as shown on figure 2. The traces highlighted in green, previously recommended for zoning, should not be zoned. Tonal features, some of which are not active faults and others of unknown origin, should not be zoned.

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Reviewed, recommendations approved.
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